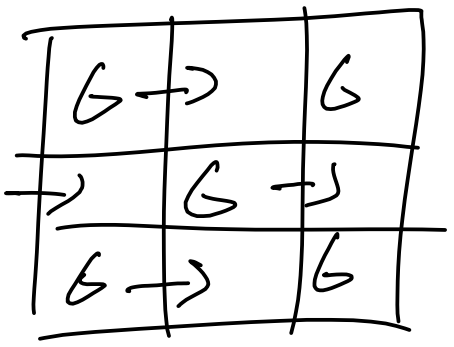
P1.1)

G1	R2	G3	R4	G5
B6	G7	B8	G9	B10
G11	R12	G13	R14	G15
B16	G17	B18	G19	B20
G21	R22	G23	R24	G25

How to interpolate?

1) Nearest neighbor interpolation



2.) Bilinear interpolation (better!)

$$R_{13} = \frac{R_{12} + R_{14}}{2}$$

$$B_{13} = \frac{B_8 + B_{18}}{2}$$

$$G_{12} = \frac{G_7 + G_{11} + G_{13} + G_{17}}{4}$$

$$B_{12} = \frac{B_6 + B_8 + B_{16} + B_{18}}{4}$$

⋮

3) more fancy methods using a larger neighborhood

P1.2)

a) Observation: $R = 0$ at all points!

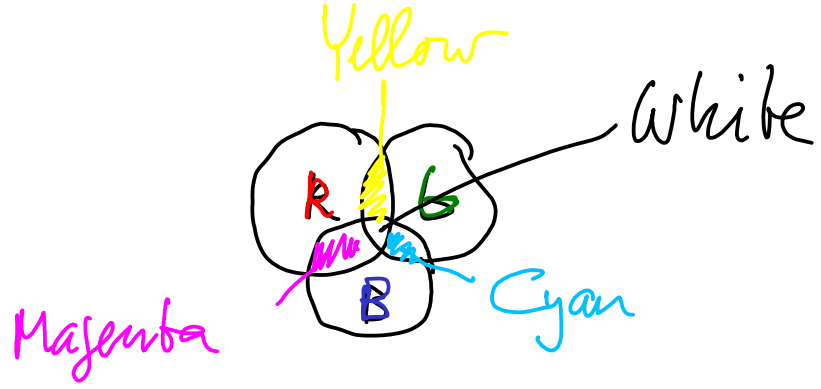
$P(2,2)$:

$$R = 0$$

$$G = \frac{G(1,2) + G(2,3) + G(3,2) + G(2,1)}{4}$$

$$= \frac{4}{4} = 1$$

$$B = 1$$



$\Rightarrow$ Pixel (2,2) is cyan

Similar operation for (2,3), (3,2) and (3,3)

$\Rightarrow$ <u>all</u> pixel positions have the color cyan!

(just a DC signal is observed after interpolation)

b) Image shifted by +1 hor/ver $\Rightarrow$ blue is cancelled out.

$\Rightarrow$ $R=1$, $G=1$, $B=0$ for all positions

$\Rightarrow$ all pixels are yellow!

P2.3] Capture with Bayer pattern:

- interpolation of two colors at each pixel position (2 or 4 neighbors involved)

⇒ introduction of correlation between pixels

Approach:

- Hypothesis: manipulation breaks correlation at boundary of area

⇒ Calculate probability map indicating extent of correlation → use this for detection.